Maine Department of Transportation Highway Program

GEOTECHNICAL REPORT

Highway Reconstruction Rte. 1A, Wilson Street Brewer, Maine

Prepared by: Karen Gross Geotechnical Design Engineer

Penobscot County

Soils Report No. 2009-116

PIN 13077.00 Fed. No. NH-1307(700)E October 21, 2009



Highway Program

Brad Foley, Program Manager Rich Crawford & Todd Pelletier, Assistant Program Managers Phone: 624-3480 Fax: 624-3481

Memorandum

To: Michel Morin From: Karen Gross Date: 10/21/09

Subject: Geotechnical Information

Brewer, Wilson Street (Rt. 1A)

PIN 13077.00

The preliminary subsurface investigations and lab testing have been completed for the Wilson Street project in Brewer. The primary focus of these investigations was to determine the thickness of the existing HMA for widening purposes and to collect soils information for the design and installation of traffic signal structures.

Project Description

The project begins at the intersection with Greenpoint Road, and extends easterly 0.45 miles to the entrance of Walmart. The proposed scope of work includes widening the existing roadway on the westbound side of the roadway to accommodate addition travel lanes.

Existing Pavement Structure

Five pavement cores were collected to determine the average thickness of the existing HMA. Cores were collected at stations 101+00, 96+00, 90+00, 86+00, all 10 feet to the left of the existing centerline, and at station 81+50, 15 feet to the right of the existing centerline. On average, the roadway has 8 " to 8 ½" of HMA in the travel lanes on both sides of the roadway. Photo's of the cores are attached at the end of this memo for your reference.

As-built plans were located for the original roadway construction in 1966. These plans indicate that the roadway was constructed with 7" of HMA over 24" of base gravel (31" total section). The base gravels from this period of time most closely represent our current specification for Aggregate Base Course –Type B for the upper 9", and Type C for the lower course. The difference in HMA thickness from as-built and the existing HMA is due to milling and overlays done since the original construction. Therefore, the existing overall pavement structure thickness is approximately 32" to the left of the centerline.

The existing subgrade most probably consists of sand with a layer of silt not far below it. The asbuilt plans indicate that the subgrade was undercut and replaced with granular borrow if poor soils were encountered. The Surficial Geology map for the Brewer Quadrangle indicates that the surficial soils consist of Presumpscot Formation (fine-grained marine silts and clays) and Glacial Till (mix of sand, gravel, silt, clay, cobbles, and boulders).

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The Soil Conservation Survey (SCS) maps show three soil units at this location: Biddeford silt loam (BoA), Scantic silt loam (ScB), and Suffield silt loam (SuB, SuC). SCS maps were developed for agricultural purposes, but they contain a section with information on the engineering properties and classifications of the soils that are useful. Table 1 lists the SCS soils and related engineering properties.

Table 1: Soil Conservation Survey Engineering Properties Summary

Map	G - 11	Brief	Classification		Permeability	Depth to High	Frost
Symbol	Soil	Description	Unified	AASHTO	(in/hr)	Water Table (ft)	Susceptibility
	Biddeford silt	marine silt &					
BoA	loam	clay	ML-CL	A-6	0.20 to 0.63	at surface	high
	Scantic silt	marine silt &					
ScB	loam	clay	ML-CL	A-4, A-6	0.20 to 0.63	at surface	high
	Suffield silt	marine silt &					
SuA	loam	clay	ML-CL	A-4, A-6	0.20 to 2.0	> 5	moderate

Pavement Design Recommendations

The scope of this project is to widen the existing pavement structure on the westbound side of the road, and match the new pavement materials depths as close as possible to the existing structure. I have completed a design check to ensure what we are matching into will meet the future design period (20 years). These as-built designs are attached for your reference.

Wilson Street is classified as a principal arterial on the National Highway System (NHS). In accordance with Chapter 13 of the Highway Design Guide, the recommended input values for the pavement design are a reliability level of 95%, an initial and terminal serviceability of 4.5 and 2.5 respectively, and an overall standard deviation of 0.45. The ESAL'S as calculated from the traffic data and for a 20-year design period are 2,270,300. Based on the geology and as-built information, a resilient modulus (Mr) value of 3500 psi to 4000 psi is recommended for the pavement structure design. A Mr value of 3500 psi will result in a more conservative design.

As you can see from the as-built pavement design outputs, the existing structure is considered slightly over-designed (8" HMA over 9" base gravel, 15" subbase gravel). Please note that this only considers the existing layer thicknesses and not the quality or condition of the existing HMA

I also ran a few more designs to see what actually meets future structural requirements in case you need to consider the project budget. A total structure thickness of 32" was used to match the existing total thickness as close as possible, The goal in doing these designs was to reduce the required thickness of HMA needed to meet design requirements.

The following designs meet future structural requirements:

Mr = 3500 psi Subbase Option:

7.5" HMA

24.5" Subbase gravel

Mr = 4000 psi

Subbase Option:

7" HMA

25" Subbase gravel



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Mr = 3500 psi
Base Gravel Option:

6" HMA 13" Base Course gravel

13" Subbase gravel

Mr = 4000 psi Base Gravel Option: 5" HMA

14" Base Course gravel
13" Subbase gravel

All pavement designs are attached at the end of this memo for your reference.

Traffic Signal Structure Locations

Subsurface information was collected at the proposed light base structures using standard penetration testing and split spoon samples at all locations. In general, there is approximately 3' to 3.5' of sand overlying silt or sand with variable amounts of silt. The silt deposit is located on the left side of the roadway, and the sand with silt deposit lies on the right side of the roadway (based on design stationing). The soils information from the investigations correlates with the published geology information.

Refusal was encountered at 10.7' below the ground surface (bgs) in boring HB-BREW-101, at 11.5' bgs in boring HB-BREW-102, at 5.4' bgs in boring HB-BREW-103, and at 8.3' in boring HB-BREW-104. Groundwater was encountered at 8.0' bgs in boring HB-BREW-101 and at 8.2' bgs in boring HB-BREW-102 at the time of drilling. Groundwater was not encountered in borings HB-BREW-103 and HB-BREW-104, however it was noted that the soils were wet at approximately 3.50 feet below the ground surface in both borings. Please note that groundwater fluctuations occur seasonally and can vary with temperature and precipitation.

Lab testing was performed on five samples to determine gradations, classifications, and soil index properties. Testing was done on samples primarily in the anticipated bearing layer for the signal structure foundation. The Table 2 summarizes the field information collected including the soil layer depths, blow counts (corrected), depth to refusal, depth to groundwater, the AASHTO and Unified Soils Classifications, and soil index properties.

Table 2: Boring and Lab Testing Summary

Boring #	Station	Offset (ft)	Depth of Soil Layer from Surface (ft)	Soil Type	Blow Count (N ₆₀)	Refusal (ft bgs)	Water (ft bgs)	Lab Test Results (AASHTO and UC)
HB-BREW-101	82+66	42.0 Rt	0.00 - 0.30	Topsoil				
			0.30 - 3.00	SAND, little gravel				
			3.00 – 10.70	SAND, some silt	29		8.00	A-1-b, SM wc=9.7%
			10.70 -	Refusal		10.70		
HB-BREW-102	82+45	49.0 Lt	0.00 -0.30	Topsoil				
			0.30 - 3.50	SAND				
			3.50 – 10.50	clayey-SILT	25		8.2	A-6, CL wc=20.3%, LL=31, PI=12
			10.50 – 11.50	silty SAND, some gravel	85			A-4, SM wc=12.4%
			11.50 -	Refusal		11.5		



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Boring #	Station	Offset (ft)	Depth of Soil Layer from Surface (ft)	Soil Type	Blow Count (N ₆₀)	Refusal (ft bgs)	Water (ft bgs)	Lab Test Results (AASHTO and UC)
HB-BREW-103	81+47	34.0 Rt	0.00 - 0.30	Topsoil				
			0.30 - 3.50	SAND				
			3.50 – 5.40	SAND, some silt				A-2-4, SM wc=8.6%
			5.40 -	Refusal		11.5		
HB-BREW-104	81+63	35.0 Lt	0.00 - 0.30	HMAl				
			0.30 - 3.50	SAND, little gravel				
			3.50 – 7.20	SILT, trace sand and gravel	21			A-4, CL-ML wc=19.1% LL=23 PI=6
			7.20 - 8.30	SILT, some sand				
			8.30 -	Refusal				

I have attached the geology maps, boring logs, lab testing information, Geoplans, and the 1966 As-Built plans for your reference in addition to the information mentioned above. Please let me know if I can provide you with any additional information that might be needed for the final design.

State of Maine - Department of Transportation <u>Pavement Core Summary Sheet</u>

Town(s): Brewer

Project Number: 13077.00

24-4	or ·	Pavement Depth	Harb 1			0
Station	Offset			PC-	Saved	Comments / Date
(Feet)	(Feet)	(Inches)	Pavement	Number	Core	5/5/2009
81+50	15.0 Rt.	7.50		1	yes	Picture Taken
86+00	10.0 Lt.	8.00		2	yes	Picture Taken
90+00	10.0 Lt.	8.25		3	yes	Picture Taken
96+00	10.0 Lt.	8.50		4	yes	Picture Taken
101+00	10.0 Lt.	8.50		5		Picture Taken
101+00	10.0 Lt.	0.30		5	yes	Ficture rakeri
	†					
	 					
	+					
	-					
	-	•			•	

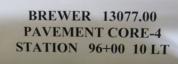












BREWER 13077.00 PAVEMENT CORE-5 STATION 101+00 10 LT

I	Main	e Dep	artment	of Transport	ation		Project: Wilson Stret/US Route 1A				Boring No.:	EW-101		
			Soil/Rock Exp US CUSTOM				Location	n: Brev	wer, Ma	ine	PIN:	1307	77.00	
Drille	r:		MaineDOT		Elev	vation	(ft.)				Auger ID/OD:	2.25-6.75"		
Oper	ator:		E. Giguere/C.	Giles	Date	um:		NAV	VD 88		Sampler:	Standard Split	Spoon	
Logg	ed By:		B. Wilder		Rig	Type:	pe: CME 45C				Hammer Wt./Fall:	140#/30"		
Date	Start/Fi	nish:	5/5/09, 08:00-	09:00	Dril	ling M	ethod:	Holl	ow Ste	n Auger	Core Barrel:	N/A		
Borir	g Loca	tion:	82+66, 42.0 R	t.	Cas	ing ID	ng ID/OD: N/A				Water Level*:	8.0' bgs.		
		ciency Fa	nctor: 0.84			nmer	Туре:	Automa		-	Rope & Cathead □			
D = Split Spoon Sample SSA = Solid MD = Unsuccessful Split Spoon Sample attempt HSA = Holl U = Thin Wall Tube Sample RC = Roller MU = Unsuccessful Thin Wall Tube Sample attempt WOH = wei V = Insitu Vane Shear Test, PP = Pocket Penetrometer WOR/C = w MV = Unsuccessful Insitu Vane Shear Test attempt WO1P = W					lollow Stem ller Cone weight of 14 = weight of	Auger n Auger 40lb. ha f rods or	casing		$T_V = Poole q_p = Union N-uncon Hammer N_{60} = S$	itu Field Vane Shear Strength (psf) ket Torvane Shear Strength (psf) confined Compressive Strength (ksf) rected = Raw field SPT N-value Efficiency Factor = Annual Calibrati PT N-uncorrected corrected for ham lammer Efficiency Factor/60%)*N-ur	WC = v LL = Li PL = P on Value PI = Pl mer efficiency G = Gr	= Lab Vane Shear S water content, percent quid Limit lastic Limit asticity Index ain Size Analysis nsolidation Test	trength (psf)	
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)	Graphic Log	Visual De	scription and Remarks		Laboratory Testing Results/ AASHTO and Unified Class	
0	0)		00 5	шоос				-0.30	*****	∖ SOD.				
							HSA	-3.00	50 4 50 50 50 50 50 50 50 50 50 50 50 50 50	\	damp, fine to medium SAND, little gravel. 3.0			
5 -	1D	24/20	5.00 - 7.00	3/9/12/13	21	29			60 6 8 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	Olive, moist, very stiff, SILT (Till).	nd, little gravel,	G#209203 A-1-b, SM WC=9.7% Non-Plastic		
10 -	2D	8.4/8.4	10.00 - 10.70	5/50(2.4")				-10.70		Similar to above. Rock fragr Bottom of Exploration REFUSAL	ments in tip of spoon. a at 10.70 feet below grou	10.70-nd surface.		
15 -														
20 -														
25														
Rema	rks:													

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-BREW-101

	Main	e Dep	artment	of Transporta	tion		Project: Wilson Stret/US Route 1A				Boring No.:	HB-BR	EW-102
			Soil/Rock Exp US CUSTOM/				Location	1: Brev	ver, Ma	ne	PIN:	130′	77.00
Drill	er:		MaineDOT		Elev	ation	(ft.)				Auger ID/OD:	2.25-6.75"	
Ope	ator:		E. Giguere/C.	Giles	Datu	ım:		NAV	/D 88		Sampler:	Standard Split	Spoon
Log	ged By:		B. Wilder		Rig	Type:	:	CMI	E 45C		Hammer Wt./Fall:	140#/30"	
Date	Start/Fi	inish:	5/5/09, 09:00-	10:00	Drill	ing M	lethod:	Holl	ow Ster	n Auger	Core Barrel:	N/A	
Bori	ng Loca	tion:	82+45, 49.0 L	t.	Casi	ing IC	D/OD:	N/A			Water Level*:	8.2' bgs.	
Ham	mer Effi	iciency Fa	actor: 0.84		Ham	nmer '	Туре:	Automa	ntic 🗵	Hydraulic □	Rope & Cathead □		
MD = U = TI MU = V = In	olit Spoon S Unsuccess nin Wall Tu Unsuccess situ Vane S	sful Split Spo lbe Sample sful Thin Wal Shear Test,	on Sample attemp Tube Sample att PP = Pocket Per ne Shear Test atte	RC = Rolle rempt WOH = we netrometer WOR/C =	id Stem A llow Stem er Cone eight of 14 weight of	Auger Auger IOIb. ha rods or	mmer casing		T _V = Poo q _p = Uno N-uncorr Hammer N ₆₀ = SI	tu Field Vane Shear Strength (psf) ket Torvane Shear Strength (psf) onfined Compressive Strength (ksf) acted = Raw field SPT N-value Efficiency Factor = Annual Calibrati PT N-uncorrected corrected for hamu ammer Efficiency Factor/60%)*N-ur	WC = LL = I PL = on Value PI = F mer efficiency G = G	b) = Lab Vane Shear S water content, percen iquid Limit Plastic Limit Plasticity Index Brain Size Analysis Consolidation Test	trength (psf)
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	09 _N	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks			Laboratory Testing Results/ AASHTO and Unified Class
0							HSA	-0.30	: :98:0:0	SOD, Topsoil.		0.20	
5 -	1D	24/19	5.00 - 7.00	3/7/11/14	18	25		-3.50		Brown, damp, fine to medium Olive-grey, moist, stiff, clayer		3.50	G#209204 A-6, CL WC=20.3% LL=31
10 -	2D	18/18	10.00 - 11.50	7/11/50	61	85		-10.50 -11.50		Olive, wet, very hard, SILT, Rock fragments in tip of spo Bottom of Exploration REFUSAL		11.50	WC=12.4%
15 -													
20 -													
25													

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

Boring No.: HB-BREW-102

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	Main	e Depa	artment	of Transporta	tion		Project: Wilson Stret/US Route 1A				Boring No.:	HB-BR	EW-103
			Soil/Rock Exp US CUSTOM	-			Locatio	n: Brev	ver, Ma	ne	PIN:	1307	77.00
Drille	er:		MaineDOT		Elev	vation	(ft.)				Auger ID/OD:	2.25-6.75"	
Ope	ator:		E. Giguere/C.	Giles	Date	um:	NAVD 88				Sampler:	Standard Split S	Spoon
Logg	ged By:		B. Wilder		Rig	Type:		CMI	E 45C		Hammer Wt./Fall:	140#/30"	
	Start/Fi	nish:	5/5/09, 10:00-	11:00	Dril	ling M	lethod: Hollow Stem Auger		Core Barrel:	N/A			
Bori	ng Loca	tion:	81+47, 34.0 R	t.	Cas	ing ID	/OD:	N/A			Water Level*:	None Observed	
Ham	mer Effi	ciency Fa	actor: 0.84		Han	nmer '	Туре:	Automa	atic 🖂	Hydraulic □	Rope & Cathead □		
Definitions: R = Rock Core D = Split Spoon Sample SSA = Solid St MD = Unsuccessful Split Spoon Sample attempt HSA = Hollow U = Thin Wall Tube Sample RC = Roller Cc MU = Unsuccessful Thin Wall Tube Sample attempt WOH = weight V = Insitu Vane Shear Test, PP = Pocket Penetrometer WOR/C = weight W = Unsuccessful Insitu Vane Shear Test attempt WO1P = Weight				olid Stem A bllow Stem er Cone reight of 14 weight of	Auger n Auger 40lb. ha f rods or	casing		$T_v = Poole_0$ $q_p = Uncorrected N-uncorrected Hammer N_{60} = Single N_{60}$	tu Field Vane Shear Strength (psf) ket Torvane Shear Strength (psf) onfined Compressive Strength (ksf) ected = Raw field SPT N-value Efficiency Factor = Annual Calibrati PT N-uncorrected corrected for ham ammer Efficiency Factor/60%)*N-ur	WC = LL = L PL = F on Value PI = PI mer efficiency G = Gi) = Lab Vane Shear S water content, percent iquid Limit Plastic Limit lasticity Index rain Size Analysis onsolidation Test	trength (psf)	
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)	Graphic Log	Visual De	scription and Remarks		Laboratory Testing Results/ AASHTO and Unified Class
0							HSA	-0.30		√SOD, Topsoil.		0.20	
										Brown, damp, gravelly, fine	to coarse SAND, trace sil	-0.30- t.	
								-3.50	d: 00 0 000 00			3.50	
- 5 -	1D	4.8/4.8	5.00 - 5.40	55				-5.40		Brown, wet, very hard SILT. Rock fragments in tip of spo		d, little gravel.	G#209206 A-2-4, SM
- 10 -								-		Bottom of Exploration REFUSAL	n at 5.40 feet below grou	—5.40- nd surface.	WC=8.6%
10								-					
- 15 -]					
15													
								1					
								-					
							+	-					
20 -													
- 20 -													
							+	1					
					Γ								
							+	1					
								1					
25 Rem	arke:	<u> </u>					1						

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-BREW-103

]	Main	e Depa	artment	of Transporta	tion		Project: Wilson Stret/US Route 1A				S Route 1A Boring No.: HB-BR	EW-104		
			Soil/Rock Exp US CUSTOM				Location: Brewer, Maine				PIN:1307	77.00		
Drille	er:		MaineDOT		Elev	ation	(ft.)				Auger ID/OD: 2.25-6.75"			
Oper	ator:		E. Giguere/C.	Giles	Datu	ım:	NAVD 88				Sampler: Standard Split S	Spoon		
Logg	ed By:		B. Wilder		Rig 1	Type:	: CME 45C				Hammer Wt./Fall: 140#/30"			
Date	Start/Fi	inish:	5/5/09, 11:00-	12:30	Drilli	ing M	lethod: Hollow Stem Auger				Auger Core Barrel: N/A			
Borir	ng Loca	tion:	81+63, 35.0 L	t.	Casi	ing ID	/OD:		N/A		Water Level*: None Observed	1		
Ham	mer Effi	iciency Fa	ctor: 0.84		Ham	mer 1	Гуре	:	Autom	atic 🖂	Hydraulic ☐ Rope & Cathead ☐			
D = Split Spoon Sample SSA = Some MD = Unsuccessful Split Spoon Sample attempt HSA = House HSA = HS				SSA = So HSA = Ho RC = Roll empt WOH = w hetrometer WOR/C = hempt WO1P = N	Core Samplid Stem Audilow Stem er Cone eight of 141 weight of of Neight of o	uger Auger Olb. har rods or	casing	9		$T_V = Poole q_p = Uncorr Hammer N_{60} = SI$	$ \begin{array}{llllllllllllllllllllllllllllllllllll$	WC = water content, percent f)		
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (pst) or RQD (%)	N-uncorrected	N ₆₀	Casing	Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Clas		
0							Н	SA	-0.30	3: £50:0: 0	PAVEMENT.			
									-3.50		Brown, damp, fine to medium SAND, little gravel, trace silt. 3.50			
- 5 -	1D	24/24	5.00 - 7.00	4/8/7/9	15	21			-7.20		Olive, wet, stiff, clayey-SILT, trace fine sand. 7.20	G#209207 A-4, CL-MI WC=19.1% LL=23 PL=17		
							$\vdash \setminus$		-8.30		Olive, wet, SILT, some fine to medium sand, little gravel. 8.30	PI=6		
- 10 -											Bottom of Exploration at 8.30 feet below ground surface. REFUSAL			
- 20 -	arke													
Rem	arks:													

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* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-BREW-104

State of Maine - Department of Transportation <u>Laboratory Testing Summary Sheet</u>

			i y i ootiii t	, -							
Town(s):	Brew	er					Nur	nbo	er: 13	3077.0	00
Boring & Sample	Station	Offset	Depth	Reference	G.S.D.C.	W.C.	L.L.	P.I.	Cla	assificatio	n
Identification Number	(Feet)	(Feet)	(Feet)	Number	Sheet	%			Unified	AASHTO	Frost
HB-BREW-103, 1D	81+47	34.0 Rt.	5.0-5.4	209206	1	8.6			SM	A-2-4	II
HB-BREW-104, 1D	81+63	35.0 Lt.	5.0-7.0	209207	1	19.1	23	6	CL-ML	A-4	IV
HB-BREW-102, 1D	82+45	49.0 Lt.	5.0-7.0	209204	1	20.3	31	12	CL	A-6	IV
HB-BREW-102, 2D	82+45	49.0 Lt.	10.0-11.5	209205	1	12.4			SM	A-4	Ш
HB-BREW-101, 1D	82+66	42.0 Rt.		209203	1	9.7	-N	P-	SM	A-1-b	П

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MaineDOT and Corps of Engineers Classification Systems.

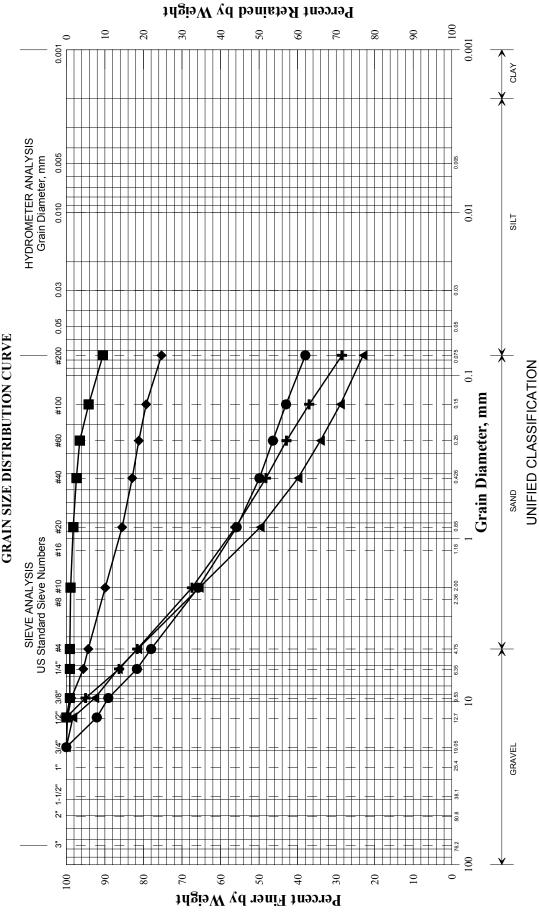
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

State of Maine Department of Transportation GRAIN SIZE DISTRIBUTION CURVE



	013077.00	•	Brower		Кероп	WHITE, TERRY
己		9	12		ΔN	
김		17	19			
Ⅎ		19.1 23	31			
W, % LL PL PI	8.6	19.1	20.3	12.4	6.7	
Description	5.0-5.4 SAND, some silt, little gravel.	SILT, trace sand, trace gravel.	Clayey SILT, trace sand, trace gravel.	10.0-11.5 Silty SAND, some gravel.	SAND, some silt, little gravel.	
Depth, ft	5.0-5.4	5.0-7.0	5.0-7.0	10.0-11.5	5.0-7.0	
Offset, ft Depth, ft	34.0 RT	35.0 LT	49.0 LT	49.0 LT	42.0 RT	
Station	81+47	81+63	82+45	82+45	82+66	
Boring/Sample No.	HB-BREW-103/1D	HB-BREW-104/1D	HB-BREW-102/1D	HB-BREW-102/2D	HB-BREW-101/1D	
	+	♦		•	•	×

	PIN
_	013077.00
	Town
	Brewer
	Reported by/Date
	WHITE, TERRY A 6/4/2009



GEOTECHNICAL TEST REPORT Central Laboratory

SAMPLE INFORMATION

Reference No. Boring No./Sample No. Sample Description Sampled Received

209206 HB-BREW-103/1D GEOTECHNICAL (DISTURBED) 5/5/2009

Sample Type: GEOTECHNICAL Location: ROADWAY Station: 81+47 Offset, ft: 34.0 RT Dbfg, ft: 5.0-5.4

PIN: 013077.00 Town: Brewer Sampler: GROSS, KAREN L

TEST RESULTS

Sieve Analysis								
(T 27, T 11)							
SIEVE SIZE U.S. [SI]	% Passing							
3 in. [75.0 mm]								
1 in. [25.0 mm]								
3/4 in. [19.0 mm]								
½ in. [12.5 mm]	100.0							
% in. [9.5 mm]	95.0							
1/4 in. [6.3 mm]	86.3							
No. 4 [4.75 mm]	81.6							
No. 10 [2.00 mm]	67.4							
No. 20 [0.850 mm]	56.1							
No. 40 [0.425 mm]	48.2							
No. 60 [0.250 mm]	42.9							
No. 100 [0.150 mm]	37.0							
No. 200 [0.075 mm]	28.5							

Direct Shear (T 236)					
Shear Angle, °					
Initial Water Content, %					
Normal Stress, psi					
Wet Density, lbs/ft³					
Dry Density, lbs/ft3					
Specimen Thickness, in					

Trimmings, Water Content, % Initial Final Void Ratio Strain Water Content, % Dry Density, lbs/ft³ Void Ratio Pmax Saturation, % Cc/C'c

Consolidation (T 216)

Liquid Limit @ 25 blows
<u>(T 89), %</u>
Plastic Limit (T 90), %

Miscellaneous Tests

Specific Gravity,
Corrected to 20°C (T 100)

Plasticity Index (T 90), %

Loss on Ignition (T 267)
Loss, % H2O, %

Water Content (T 265), % 8.6

Date Reported: 5/27/2009

	Vane Shear Test on Shelby Tubes (Maine DOT)						
Depth	3	ln.	6	ln.	Water		
taken in	U. Shear	Remold	U. Shear	Remold	Content,	Description of Material Sampled at the Various Tube Depths	
tube, ft	tons/ft²	tons/ft²	tons/ft²	tons/ft²	%	various rube depuis	

Wash Method Procedure A

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: FOGG, BRIAN



GEOTECHNICAL TEST REPORT Central Laboratory

SAMPLE INFORMATION

Reference No. Boring No./Sample No. Sample Description Sampled Received

209207 HB-BREW-104/1D GEOTECHNICAL (DISTURBED) 5/5/2009

Sample Type: GEOTECHNICAL Location: ROADWAY Station: 81+63 Offset, ft: 35.0 LT Dbfg, ft: 5.0-7.0

PIN: 013077.00 Town: Brewer Sampler: GROSS, KAREN L

TEST RESULTS

Sieve Analysis					
(T 27, T 11)					
SIEVE SIZE U.S. [SI]	% Passing				
3 in. [75.0 mm]					
1 in. [25.0 mm]					
3/4 in. [19.0 mm]	100.0				
½ in. [12.5 mm]	99.7				
3/₃ in. [9.5 mm]	98.7				
1/4 in. [6.3 mm]	95.6				
No. 4 [4.75 mm]	94.3				
No. 10 [2.00 mm]	89.9				
No. 20 [0.850 mm]	85.5				
No. 40 [0.425 mm]	82.9				
No. 60 [0.250 mm]	81.2				
No. 100 [0.150 mm]	79.3				
No. 200 [0.075 mm]	75.3				

Direct Shear (T 236)					
Shear Angle, °					
Initial Water Content, %					
Normal Stress, psi					
Wet Density, lbs/ft3					
Dry Density, lbs/ft3					
Specimen Thickness, in					
	•	•			

Consolidation (T 216) Trimmings, Water Content, % Void % Initial **Final** Ratio Strain Water Content, % Pmin Pр Dry Density, lbs/ft3 Void Ratio Pmax Saturation, % Cc/C'c

Miscellaneous Tests				
Liquid Limit @ 25 blows				
<u>(T 89), %</u>				
23				
Plastic Limit (T 90), %				
17				
Plasticity Index (T 90), %				
6				
Specific Gravity,				
Corrected to 20°C (T 100)				
Loss on Ignition (T 267)				
Loss, % H2O, %				
Mater Content (T.OCF), 0/				
Water Content (T 265), %				
19.1				

Vane Shear Test on Shelby Tubes (Maine DOT)						
Depth	3	ln.	6 In.		Water	
taken in	U. Shear	Remold	U. Shear	Remold	Content,	Description of Material Sampled at the Various Tube Depths
tube, ft	tons/ft²	tons/ft²	tons/ft²	tons/ft²	%	various rube Deptils

Date Reported: 5/29/2009

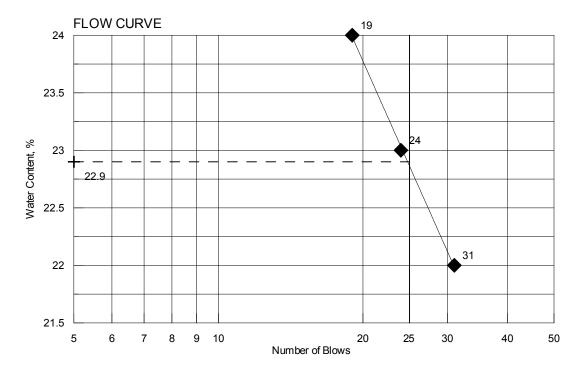
Wash Method Procedure A

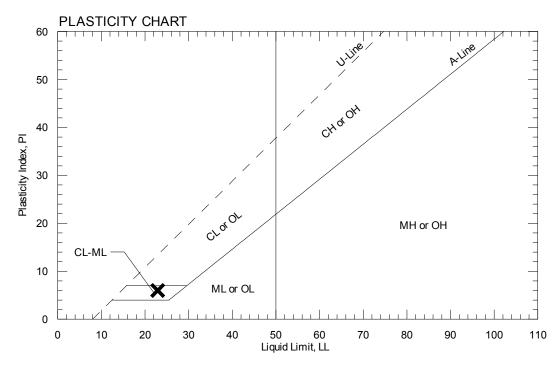
Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: FOGG, BRIAN

TOWN	Brewer	Reference No.	209207
PIN	013077.00	Water Content, %	19.1
Sampled	5/5/2009	Plastic Limit	17
Boring No./Sample No.	HB-BREW-104/1D	Liquid Limit	23
Station	81+63	Plasticity Index	6
Depth	5.0-7.0	Tested By	KDRES







GEOTECHNICAL TEST REPORT Central Laboratory

SAMPLE INFORMATION

Reference No. Boring No./Sample No. Sample Description Sampled Received

209204 HB-BREW-102/1D GEOTECHNICAL (DISTURBED) 5/5/2009

Sample Type: GEOTECHNICAL Location: ROADWAY Station: 82+45 Offset, ft: 49.0 LT Dbfg, ft: 5.0-7.0

PIN: 013077.00 Town: Brewer Sampler: GROSS, KAREN L

TEST RESULTS

Sieve Analysis				
(T 27, T 11)				
SIEVE SIZE U.S. [SI]	% Passing			
3 in. [75.0 mm]				
1 in. [25.0 mm]				
3/4 in. [19.0 mm]				
½ in. [12.5 mm]	100.0			
3/8 in. [9.5 mm]	99.1			
1/4 in. [6.3 mm]	99.1			
No. 4 [4.75 mm]	99.1			
No. 10 [2.00 mm]	98.9			
No. 20 [0.850 mm]	98.2			
No. 40 [0.425 mm]	97.4			
No. 60 [0.250 mm]	96.5			
No. 100 [0.150 mm]	94.2			
No. 200 [0.075 mm]	90.5			

Direct Shear (T 236)					
	t Shear (1	t Shear (T 236)			

Consolidation (T 216) Trimmings, Water Content, % Void % Initial **Final** Ratio Strain Water Content, % Pmin Pр Dry Density, lbs/ft3 Void Ratio Pmax Saturation, % Cc/C'c

Miscellaneous Tests				
Liquid Limit @ 25 blows				
<u>(T 89), %</u>				
31				
Plastic Limit (T 90), %				
19				
Plasticity Index (T 90), %				
12				
Specific Gravity,				
Corrected to 20°C (T 100)				
Loss on Ignition (T 267)				
<u>Loss, %</u> <u>H2O, %</u>				
Water Content (T 265), %				
20.3				

Vane Shear Test on Shelby Tubes (Maine DOT)						
Depth	Depth 3 In. 6 In.		Water			
taken in	U. Shear	Remold	U. Shear	Remold	Content,	Description of Material Sampled at the Various Tube Depths
tube, ft	tons/ft²	tons/ft²	tons/ft²	tons/ft²		various Tube Deptils

Date Reported: 6/2/2009

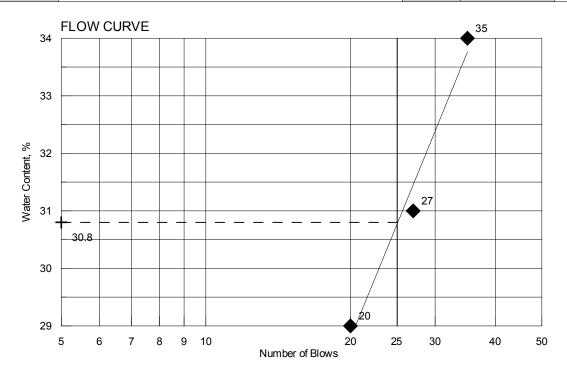
Wash Method Procedure A

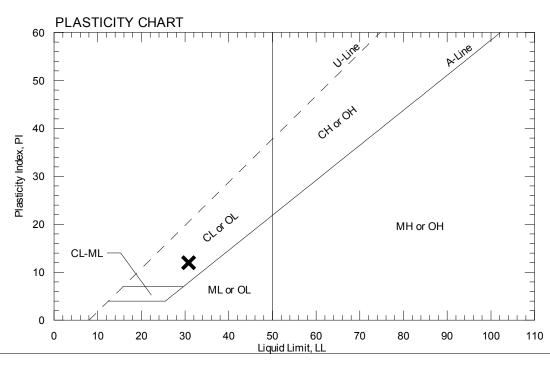
Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: FOGG, BRIAN

TOWN	Brewer	Reference No.	209204
PIN	013077.00	Water Content, %	20.3
Sampled	5/5/2009	Plastic Limit	19
Boring No./Sample No.	HB-BREW-102/1D	Liquid Limit	31
Station	82+45	Plasticity Index	12
Depth	5.0-7.0	Tested By	KDRES







GEOTECHNICAL TEST REPORT Central Laboratory

SAMPLE INFORMATION

Reference No. Boring No./Sample No. Sample Description Sampled Received

209205 HB-BREW-102/2D GEOTECHNICAL (DISTURBED) 5/5/2009

Sample Type: GEOTECHNICAL Location: ROADWAY Station: 82+45 Offset, ft: 49.0 LT Dbfg, ft: 10.0-11.5

PIN: 013077.00 Town: Brewer Sampler: GROSS, KAREN L

TEST RESULTS

Sieve Analysis						
(T 27, T 11	(T 27, T 11)					
SIEVE SIZE	% Descina					
U.S. [SI]	Passing					
3 in. [75.0 mm]						
1 in. [25.0 mm]						
¾ in. [19.0 mm]	100.0					
½ in. [12.5 mm]	92.1					
% in. [9.5 mm]	89.1					
1/4 in. [6.3 mm]	81.7					
No. 4 [4.75 mm]	78.0					
No. 10 [2.00 mm]	65.8					
No. 20 [0.850 mm]	55.8					
No. 40 [0.425 mm]	49.9					
No. 60 [0.250 mm]	46.4					
No. 100 [0.150 mm]	43.0					
No. 200 [0.075 mm]	38.0					

Direct Shear (T 236)					
Shear Angle, °					
Initial Water Content, %					
Normal Stress, psi					
Wet Density, lbs/ft³					
Dry Density, lbs/ft3					
Specimen Thickness, in					

Consolidation (1 210)							
Trimmings, Water Content, %							
	Initial	Final		Void Ratio	% Strain		
Water Content, %			Pmin				
Dry Density, lbs/ft³			Рр				
Void Ratio			Pmax				
Saturation, %			Cc/C'c				

Consolidation (T 216)

Miscellaneous Tests
Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)
Loss on Ignition (T 267) Loss, % H2O, %
Water Content (T 265), % 12.4

Vane Shear Test on Shelby Tubes (Maine DOT)						
Depth	3 ln. 6 ln.		Water			
taken in	U. Shear	Remold	U. Shear	Remold	Content,	Description of Material Sampled at the Various Tube Depths
tube, ft	tons/ft²	tons/ft²	tons/ft²	tons/ft²	%	various rube Deptils

Date Reported: 5/27/2009

Wash Method Procedure A

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: FOGG, BRIAN



GEOTECHNICAL TEST REPORT Central Laboratory

SAMPLE INFORMATION

Reference No. Boring No./Sample No. Sample Description Sampled Received

209203 HB-BREW-101/1D GEOTECHNICAL (DISTURBED) 5/5/2009

Sample Type: GEOTECHNICAL Location: ROADWAY Station: 82+66 Offset, ft: 42.0 RT Dbfg, ft: 5.0-7.0

PIN: 013077.00 Town: Brewer Sampler: GROSS, KAREN L

TEST RESULTS

Sieve Analysis						
(T 27, T 11	(T 27, T 11)					
SIEVE SIZE U.S. [SI]	% Passing					
3 in. [75.0 mm]	1 assing					
1 in. [25.0 mm]						
¾ in. [19.0 mm]	100.0					
½ in. [12.5 mm]	98.3					
3/8 in. [9.5 mm]	92.6					
½ in. [6.3 mm]	86.5					
No. 4 [4.75 mm]	81.5					
No. 10 [2.00 mm]	65.5					
No. 20 [0.850 mm]	49.7					
No. 40 [0.425 mm]	39.9					
No. 60 [0.250 mm]	34.1					
No. 100 [0.150 mm]	28.9					
No. 200 [0.075 mm]	23.0					

Direct Shear (T 236)					
Shear Angle, °					
Initial Water Content, %					
Normal Stress, psi					
Wet Density, lbs/ft3					
Dry Density, lbs/ft3					
Specimen Thickness, in					
		·			

Trimmings, Water Content, %							
	Initial	Final		Void Ratio	% Strain		
Water Content, %			Pmin				
Dry Density, lbs/ft³			Рр				
Void Ratio			Pmax				
Saturation, %			Cc/C'c				

Consolidation (T 216)

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %

Miscellaneous Tests

Plasticity Index (T 90), %

NP

Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)
Loss, % H2O, %

Water Content (T 265), % 9.7

Date Reported: 5/29/2009

Vane Shear Test on Shelby Tubes (Maine DOT)						
Depth	h 3 ln.		6	ln.	Water	
taken in	U. Shear	Remold	U. Shear	Remold	Various Tube De	Description of Material Sampled at the
tube, ft	tons/ft²	tons/ft²	tons/ft²	tons/ft²		various rube beptils

Wash Method Procedure A

Comments:

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Reported by: FOGG, BRIAN